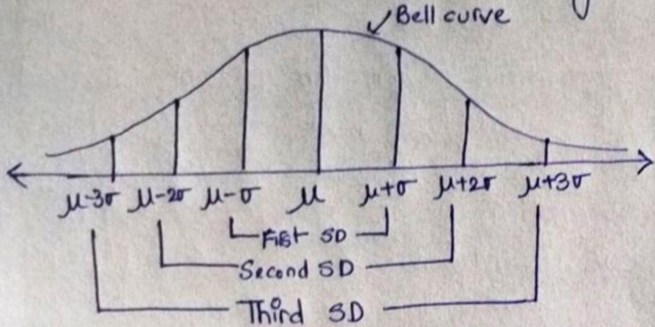
Normal / Gaussian Distribution —

Suppose a variable x (random), $x \simeq GD(\mu, \sigma)\ \sigma^2$.

x belongs to gaussian/normal distribution mean μ and standard deviation σ^2.



Empirical Values,

I) $P_r[\mu - \sigma \le x \le \mu + \sigma] \simeq 68\%$

68% of data points belonging to random variable x falls in first standard deviation.

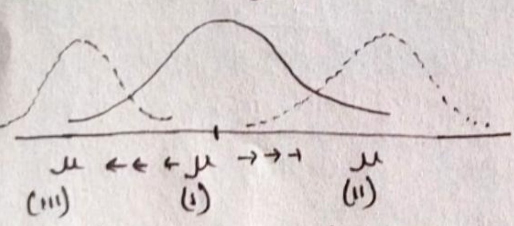
II) $P_r[\mu - 2\sigma \le x \le \mu + 2\sigma] \simeq 95\%$.

III) $P_r[\mu - 3\sigma \le x \le \mu + 3\sigma] \simeq 99.7\%$

- Normal distribution are normally bell curve / normal curve.
- Tendency to cluster data around central value, central value is mean.

For example — Exam score in the exam. Some people do great in the exam. Some people do bad in the exam. Most of the people do aroud mean of exam.

population mean μ, characterise the position of normal distribution.

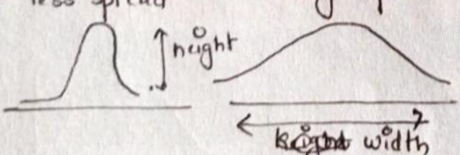


if we move mean (μ) to right (I) → (II) then population curve shift right or even if we move left (I) → (III). then population curve shift to left. Because mean is the most populated one.

population standard deviation, σ characterise the spread of normal distribution.

if σ = small, less spread

if σ = high high spread



If σ is decreasing it become tall, and if σ is increasing it become more spread, this happen because σ is a density function and in density function area shoud be 100% or 1 (Total area). So spread is up down left right. (Adjust height / width)

→ The parameter completely characterized normal distribution. (σ, μ)

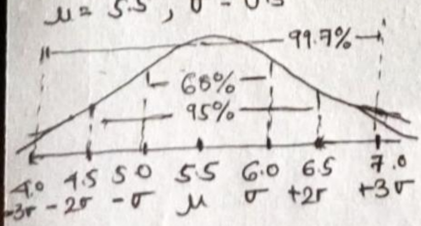
$$\boxed{X \sim N(\mu, \sigma)}$$

(variable; Normal distribution; mean; standard deviation)

Consider height of a class. (68–95–99.7 rule)

Suppose mean (μ) height is 5.5. We want to have a difference of 0.5. $\sigma = 0.5$.

$\mu = 5.5$, $\sigma = 0.5$



- 1st SD, mean $-\sigma$ to σ which is 68% of population is between 5 to 6 height.
- 2nd SD, mean -2σ to 2σ, which is 95% of the people have height 4.5 to 6.5 height
- 3rd SD, suggest -3σ to 3σ, which is 99.7% of people have height 4 to 7 height.